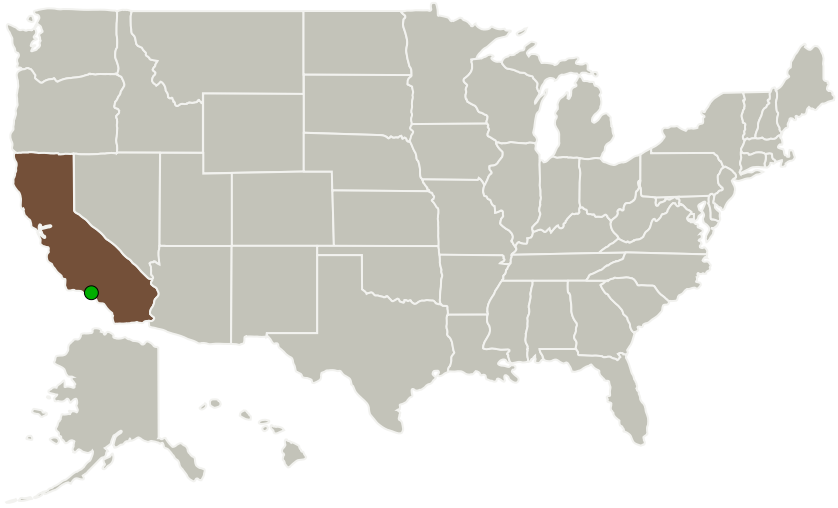
Silicon Based Local Oscillator Source Array at 1.9 THz

Completed Technology Project (2017 - 2020)

Project Introduction

We plan to design, fabricate and test an integrated 64-pixel local oscillator (LO) array operating at 1.8 - 2.1 THz that utilizes silicon micromachining to enable hundreds of pixels. Essential to our understanding of stellar formation, this array will permit rapid high-resolution spectral mapping of the [CII] and [OI] spectral lines in the 1.8 - 2.1 THz region, across wide sections of the sky. This technology has the potential to reduce the mass, volume and complexity of receivers arrays while significantly increase the pixel count of detectors. This local oscillator source array will utilize silicon as the main material for all the waveguide circuitry as well as a unique configuration of GaAs Schottky diodes on reticles. The proposed work will advance the technology in several key areas: • The development of a novel Schottky diode schematic to allow a wafer level integration of 16 multipliers on the same chip using a GaAs membrane frame. • The integration of all passive and active components into a compact silicon package with vertical integration of the waveguide feeds. The GaAs reticle will be one of the vertically stacked wafers. • The utilization of commercially available state of the art amplifiers at 200 GHz to reduce the power consumption per pixel.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Organization:

California Institute of Technology (CalTech)

Responsible Program:

Astrophysics Research and Analysis

Astrophysics Research And Analysis

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Organizations Performing Work	Role	Type	Location
California Institute of Technology(CalTech)	Lead Organization	Academia	Pasadena, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Management

Program Director:

Michael A Garcia

Program Manager:

Dominic J Benford

Principal Investigator:

Cecile Jung-kubiak

Co-Investigators:

Goutam Chattopadhyay
Karen R Piggee
Theodore J Reck
Choon Sup Lee
Maria Alonso Del Pino

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.3 Power Management and Distribution
    - TX03.3.4 Advanced Electronic Parts

Target Destination

Outside the Solar System